DOCUMENT RESUME

ED 482 566 SE 068 331

AUTHOR	Thorson, Annette, Ed.
TITLE	ENC Focus Review.
INSTITUTION	Eisenhower National Clearinghouse for Mathematics and Science Education, Columbus, OH.
SPONS AGENCY	Office of Educational Research and Improvement (ED), Washington, DC.
REPORT NO	ENC-03-003
PUB DATE	2003-00-00
NOTE	17p.
CONTRACT	RJ97071001
AVAILABLE FROM	Eisenhower National Clearinghouse for Mathematics and Science Education, 1929 Kenny Road, Suite 400, Columbus, OH 43210-1079. Tel: 800-621-5785 (Toll Free); Fax: 614-292-2066; e-mail: info@enc.org; Web site: http://www.enc.org.
PUB TYPE	Reports - Descriptive (141)
EDRS PRICE	EDRS Price MF01/PC01 Plus Postage.
DESCRIPTORS	*Beginning Teacher Induction; Elementary Secondary Education; *Interdisciplinary Approach; *Literature; *Mathematics Education; Mentors; Pictorial Stimuli; Teaching Methods

ABSTRACT

The mission of the Eisenhower National Clearinghouse (ENC) is to identify effective curriculum resources, create high-quality professional development materials, and disseminate useful information and products to improve K-12 mathematics and science teaching and learning. This issue of "ENC Focus" contains articles related to mathematics teaching and teacher collaboration. Articles include: (1) "Bringing Literature into the High School Math Class" (Laurie Pines)-- through a high school literacy program, a program combining literature and mathematics is developed; (2) "Using Picture Books in High School Math" (Judy Spicer)--high school students enjoy and learn from picture books the same as younger students do; and (3) "Collaborating with Colleagues to Improve Student Learning" (Harry Wong)--the elements of effective programs for helping new teachers succeed is presented. (MVL)

Reproductions supplied by EDRS are the best that can be made
from the original document.

October 2003

ED 482 566

FOCUS ON REVIEW

Bringing Literature into the High School Math Class

Through a high school literacy program, teacher Laurie Pines developed a program combining literature and mathematics. (Page 3)

Using Picture Books in High School Math

High school students will enjoy and learn from picture books just as younger students do. (Page 5)

Collaborating with Colleagues to Improve Student Learning

Harry Wong, author of *The First Days of School* and *New Teacher Induction*, describes the elements of effective programs for helping new teachers succeed. (Page 8)

And much more!

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)
☐ This document has been reproduced as received from the person or organization originating it.
☐ Minor changes have been made to improve reproduction quality.
• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

Eisenhower National Clearinghouse
www.enc.org

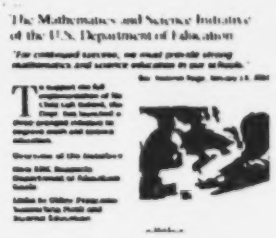
BEST COPY AVAILABLE

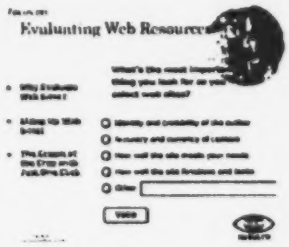
ENC Is Changing—Every Week!

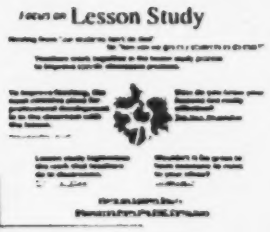
T W R F S S M T W R F S S M T W R F S S M T W R F S S M T W R F S

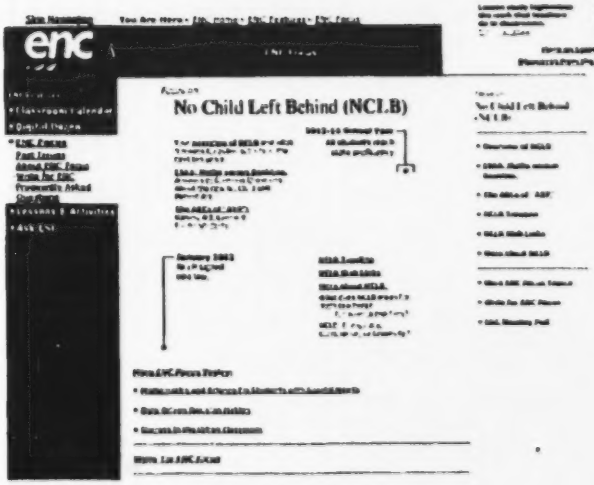
You won't want to miss a week of the online *ENC Focus* features or other timely new products and services at www.enc.org. To help you take advantage of these resources, we invite you to register now for ENC Updates, our email newsletter tailored to your interests.

ENC Updates will give you news about current *ENC Focus* articles and upcoming topics, recent entries to Classroom Calendar, and other additions to www.enc.org.









Register now by going to www.enc.org/register/.

BEST COPY AVAILABLE

EXECUTIVE DIRECTOR:	Len Simutis
ASSOCIATE DIRECTORS	
Collaboration:	Thomas Gadsden
Instructional Resources:	Kimberly S. Lightle
Publishing:	Gay Gordon
STAFF	
Publications Manager:	Tracy Crow
Manager of Electronic Production:	Doug Line
Editor:	Annette Thorson
Senior Editor:	Carolyn Hamilton
Managing Editor:	Melanie Shreffler
Senior Graphic Designer:	Brian Deep
Interactive Media Specialist:	Nagarajan Gopalan
Contributing Editors:	Judy Duguid Julia Harris
Editorial Assistant:	Virginia Cook
Electronic Publishing:	Mark Holtman Constance Reising Deb Schaeider
Assistant Director of Instructional Resources:	Judy Ridgway
Content:	Carolee Barber Carol Damian Jennifer Ganya Terese Herrera Judy Spicer
Evaluation Data:	Ed Coss
Cataloging:	Beth Brown Janet Kahkonen-Smith Jessica Pyle Beth Stenger Linda Trombetti Lin Zhang
Acquisitions:	Dennis Beaudry Pam Bentley
Repository:	Sara Liebhaber
Information Services:	Laura K. Brendon Orville Martin
Outreach:	Gail Hoskins
Computer & Network Services:	Roger Cunningham Richard Huggins Tom Marker Stephen P. Sarapata
Human Resources:	Michelle Harris
Fiscal Services:	Ayanna Bandele-Poindexter
Administrative Support:	Frances Burkett Joyce Francis Linda Price

ENC Mathematics and Science Advisory Boards

Charles Allan, Michigan State Department of Education, Retired
Ronald Anderson, University of Colorado, Boulder
Jerry Becker, Southern Illinois University
Jo Ann Carr, University of Wisconsin, Madison
Joan Countryman, Lincoln School, Providence, Rhode Island
Shirley Butler, ENC Capital Collection & Demonstration Site, George Washington University
Arlene Hambrick, North Central Regional Education Laboratory
Elizabeth Horsch, Retired Teacher of High School Science, Wyoming
Patricia Hosken, Redondo Beach Unified School District, California
Eric Packenham, National Science Teachers Association
Carlo Parravano, North Institute for Science Education
Vasha Rosenblum, Retired Elementary Teacher, Alabama
Harry Tunis, National Council of Teachers of Mathematics

ENC Focus is published by the Eisenhower National Clearinghouse for Mathematics and Science Education. ENC is funded at least in part through Contract No. RJ97071001 with the U.S. Department of Education. The contents of this publication do not necessarily reflect the views or policies of the U.S. Department of Education nor does the mention of trade names, commercial products, or organizations imply endorsement by the U.S. Government. ENC welcomes readers' comments and questions.

The Mission of the Eisenhower National Clearinghouse

is to identify effective curriculum resources, create high-quality professional development materials, and disseminate useful information and products to improve K–12 mathematics and science teaching and learning.

To accomplish its mission, ENC...

Acquires and catalogs mathematics and science curriculum resources, creating the most comprehensive collection in the nation.

Provides the best selection of math and science education resources on the Internet.

Supports teachers' professional development in math, science, and the effective use of technology.

Serves all K–12 educators, parents, and students with free products and services.

Collaborates with the Eisenhower Regional Consortia and many other organizations to promote education reform.

Visit www.enc.org

HOW TO REACH US:

For the most up-to-date information on services and programs of the Eisenhower National Clearinghouse, visit our web site at www.enc.org. You can also contact ENC by email, telephone, or postal delivery:

ENC, 1929 Kenny Road, Suite 400, Columbus, OH 43210-1079

General Information
Hours: Monday-Friday:
8 a.m.-5 p.m. ET
Toll free: (800) 621-5785
Telephone: (614) 292-7784
Fax: (614) 292-2066
Email: info@enc.org

Acquisitions
Telephone: (614) 688-3265
Email: submit@enc.org

Publishing
Telephone: (614) 292-3728
Email: editor@enc.org

Reference Desk
Telephone: (614) 292-9734
Email: info@enc.org

The Eisenhower National Clearinghouse for Mathematics and Science Education is funded by the U.S. Department of Education.

U.S. Department of Education
Roderick R. Paige, Secretary

BEST COPY AVAILABLE

What's New with *ENC Focus*?

If you are a long-time ENC subscriber, you've noticed by now that this issue of *ENC Focus Review* looks quite different from what you've seen in the past. The changes to our print publication go hand in hand with the changes to ENC Online (www.enc.org). ENC Online now presents fresh new content every week!

From now on, ENC will publish *ENC Focus Review* in print six times during the school year—you'll be receiving valuable information even more often than you did before. We chose the new name because the print publication is a sampler of what you'll find online.

We have two big goals for this new print publication. First, we hope that these pages will continue to provide inspiration and resources to help you with your teaching. Second, with each page of the publication we are building a bridge to ENC Online.

Every article you see here is available online, as always. But now *ENC Focus Review* is just a taste of what you can find online. Each week, the online version of *ENC Focus* (www.enc.org/focus/) highlights a different important topic for math and science teachers, with much more information than we could ever publish in print.

For each online topic, ENC offers a carefully crafted selection of relevant material—sometimes you'll find teacher-written articles, sometimes you'll see compilations of curriculum resources or web links. Throughout this print issue, you'll see information about the topics we have online already.

To see everything we have to offer, you'll need to check back with ENC Online frequently. This print publication is one way to learn about and share what ENC offers. Our new email newsletter is another way to stay in touch (see inside front cover for details).

We always welcome comments or feedback on our products and services. And we still look for teacher-written articles, on any topic of your choice. Contact editor@enc.org with your ideas or suggestions.

Laurie Pines has developed a variety of tools for using literature with her students. See the online version of this article for a sample reading graphic organizer, a list of reading prompts for *Fermat's Enigma*, and a term paper assignment sheet, as well as a list of the teacher and student resources she finds particularly helpful. The online article is one portion of the full *ENC Focus* issue on Literature in High School Mathematics—www.enc.org/focus/mathlit/.

Bringing Literature into the High School Math Class

This high school teacher developed a program that uses literature to build mathematics interest and understanding in her students.

by Laurie Pines, Fremont High School, Sunnyvale, California

Six years ago, I became involved in the Secondary School Literacy Project, a program of the Bay Area Coalition of Essential Schools in the San Francisco area. Being the only math teacher in the group, I did not think that teachers of other disciplines would be interested in a math literacy program.

But soon I realized that my project was not a solo affair. My English and social studies colleagues helped me find relevant literacy tools and reading techniques, and they provided suggestions for books to use with my math classes.

Today I have the beginnings of a successful mathematics literacy program: it is fun, relevant, and a great learning tool for my students. I have found a plethora of stories and creative methods to approach the task. Literature in mathematics class is not an oxymoron, but a viable and motivating activity to pursue with your students.

Begin with Reading Comprehension

I adapt the program for use with different mathematics classes, but generally, I begin by helping students improve their reading comprehension. They are taught and practice different reading techniques with the assignments. An excellent resource for these techniques is *Reading Reminders, Tips, Tools and Techniques* (Burke, 2000).

One of the most useful reading-improvement techniques is a two-column graphic organizer that helps my students become aware of their own metacognitive processes. I explain to the students that they are becoming aware of the conversation happening in their heads as they read.

As they find thought-provoking material in their reading, students record the words from the text on the left-hand column of the graphic organizer. Then they write their own thoughts and questions triggered by the text on the right. Students are introduced to this graphic organizer while reading *Stories to Solve* (Shannon, 1985). (See the **Reading Graphic Organizer** for an example,

included online at www.enc.org/focus/mathlit/.)

Next: Stories That Require Deductive Reasoning

Stories to Solve requires deductive reasoning, an important skill in mathematics. I also use Sir Arthur Conan Doyle's Sherlock Holmes stories for this purpose.

I introduce the readings with the game 221B Baker Street. This interesting game uses deductive reasoning and can easily be adapted to groups of four players.

The problem with Holmes stories is the difficult language. To make the reading more accessible to my students, I have them skim the story and record any unfamiliar words. We then, as a class, research the words and discuss the meanings that would best fit the context of the story.

Another option is to use stories from a book that is easier to read. *The Man Who Counted* by Malba Tahan works well with my students.

(Editor's Note: Sophisticated teenaged readers who enjoy Sherlock Holmes stories will benefit from the strong mathematics component in the final mystery solved in *The Beekeeper's Apprentice*, a 1994 historical mystery novel by Laurie R. King. In addition to Holmes and Watson, characters include a teenaged girl, making the book more appealing to girls. Reviews are available online at www.mysteryguide.com/bkKingApprentice.html.)

Finally: A Mathematical Enigma

Fermat's Enigma by Simon Singh is the last book my students read. It tells the story of the quest to solve Pierre de Fermat's Last Theorem.

For more than three centuries, professional and amateur mathematicians alike searched for the elusive proof that Fermat himself claimed to have solved, but never recorded. The book takes the reader through thousands of years of mathematical history and discoveries. It concludes with Professor Andrew Wiles from Princeton University publishing a correct proof.

I introduce the book by showing the video *The Proof*, which provides an excellent overview of the Last Theorem story. The students then read the book, keeping a log of all the mathematicians they encounter. As they proceed through the book, I continue to introduce various reading techniques. (In the online version of the article, see **Reading Prompts for *Fermat's Enigma*** for samples of reading questions and methods.)

The students are assigned the term paper midway into the semester. I require each student to choose a mathematician from his or her log and research that person. Students write a term paper based on their research and also prepare a short oral report that introduces his or her mathematician to the class. (See **Term Paper Assignment Sheet** online.)

Students are often creative with their oral reports. Two years ago a student began his report on Archimedes by saying, "Archimedes is the man who invented streaking."

The program ends with the video *Fermat's Last Tango*, a musical based on this quest to find a solution to Fermat's Last Theorem. The video is well worth the time to view and enjoy.

Laurie Pines was a 2002-2003 Albert Einstein Distinguished Educator Fellow in Washington, D.C. She teaches mathematics at Fremont High School in Sunnyvale, California, and at San Jose State University.
Email: lpines@att.net

References

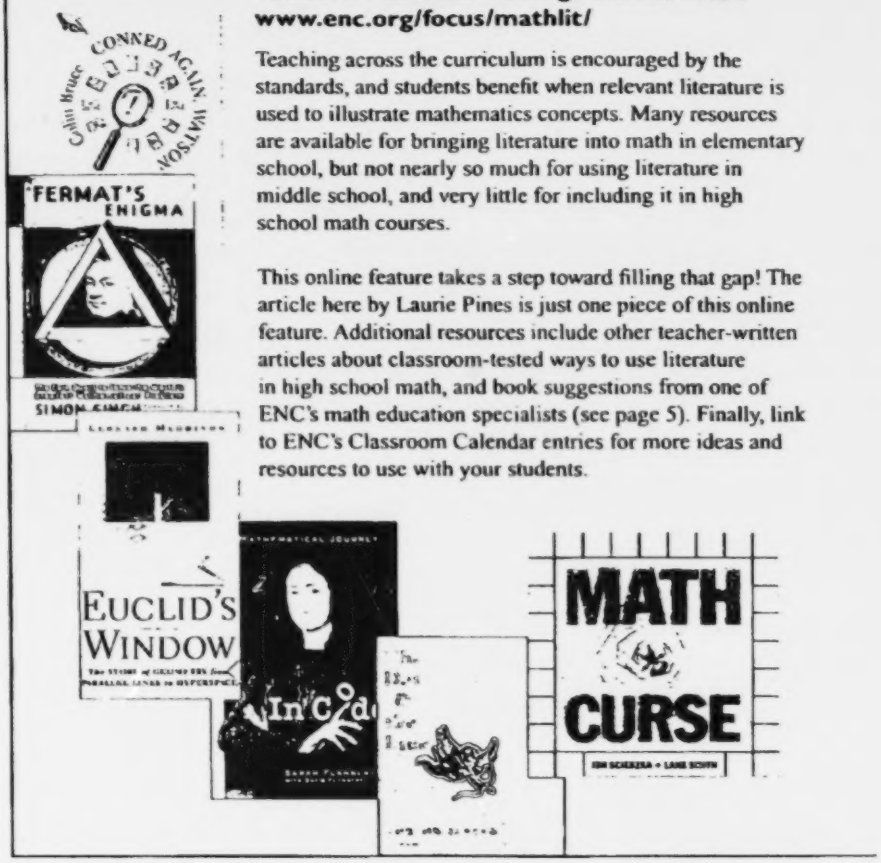
Burke, Jim. (2000). *Reading Reminders, Tips, Tools and Techniques.* Portsmouth, NH: Boynton/Cook Publishers.

Shannon, George. (1985). *Stories to Solve.* New York: HarperCollins.

Focus on Literature in High School Math
www.enc.org/focus/mathlit/

Teaching across the curriculum is encouraged by the standards, and students benefit when relevant literature is used to illustrate mathematics concepts. Many resources are available for bringing literature into math in elementary school, but not nearly so much for using literature in middle school, and very little for including it in high school math courses.

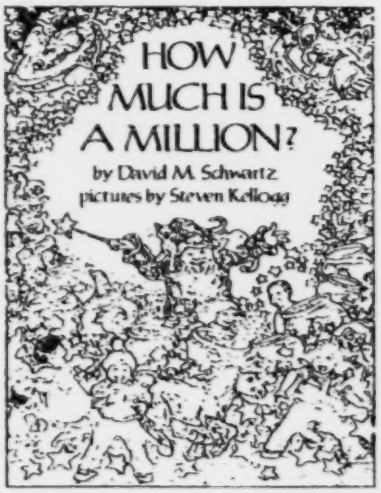
This online feature takes a step toward filling that gap! The article here by Laurie Pines is just one piece of this online feature. Additional resources include other teacher-written articles about classroom-tested ways to use literature in high school math, and book suggestions from one of ENC's math education specialists (see page 5). Finally, link to ENC's Classroom Calendar entries for more ideas and resources to use with your students.



BEST COPY AVAILABLE

Using Picture Books in High School Math

by Judy Spicer, ENC Instructional Resources



When we decided to create the online feature Focus on Literature in High School Math, we assumed we would emphasize books written for teens and adults. But using picture books written for younger children is also an excellent way to explore topics in high school mathematics. It is amazing how artwork can make mathematics concepts real for students.

According to mathematics education professor and former high school math teacher Jennifer Bay-Williams, "opening a mathematics lesson with a children's book sparks enthusiasm.... Weeks after the activity, students will remember the story and its related investigation, and this will help them to remember the mathematics." (See Bay-Williams's article online for details of two literature-based activities.)

Another, similar comment came from the web site of the National Council of Teachers of English. In response to a question on the site's interactive area (which is no longer archived), Lind Williams, a teacher at Provo, Utah, High School, wrote:

> "I would suggest that the tenth grade math teacher use picture books rather than short stories. There are a plethora of picture books on math-related topics, and tenth graders would love them. What you do is just joke around about the fact that these are children's books and then ham up the reading. Once you start reading the books, the tenth graders will love it." (Contact Williams via email: lindw@provo.edu.)

Based on these recommendations, we searched the ENC collection and elsewhere for picture books that we would recommend to high school math teachers. We also discovered that the books may be for children on one level, but on other levels they speak to older students and adults. For example, *The Librarian Who Measured the Earth* can be enjoyed as a history or biography, or the reader can focus on and develop the trigonometry involved. *The Dot and the Line: A Romance in Lower Case Mathematics* is designed to appeal to the romantic in us all and offers a different take on geometrical relationships.

As with any teaching technique, there is more than one way to present picture books in a high school math class. A teacher can choose one book to read aloud to a class to introduce or reinforce a mathematics topic, or even to encourage students to think differently about the topic. Or if a learning goal is mathematical communication, students can select a book from the list, report on the story (characters and setting), and explain the related mathematics. Another idea, depending on the book, might be to have students write sequels or prequels based on the mathematical story line.

The mathematics in the picture books listed here is real—as well as being beautifully illustrated and accessible. Have some fun with it!

Books in the ENC Collection

Note: Web addresses are included for each full ENC catalog record; links to the records are quick and easy in the full online feature at www.enc.org/focus/mathlit/.

1. *The Librarian Who Measured the Earth* by Kathryn Lasky (Little, Brown, 1994).

   This is a story made for students of trigonometry. The illustrated biography describes how Eratosthenes, the head librarian of the Alexandria Museum in Ancient Egypt, measured the circumference of the Earth with amazing accuracy. (www.enc.org/records/015932/)

   For an online version of this story and a related web project, check out The Noon Day Project at www.k12science.org/noonday/. (www.enc.org/records/018207/)

2. *Sir Cumference and the First Round Table* by Cindy Neuschwander (Charlesbridge, 1997).

   This clever tale uses math

   vocabulary as Sir Cumference and his son Radius investigate a variety of geometric shapes to find the best design for the king's table. (www.enc.org/records/009844/).

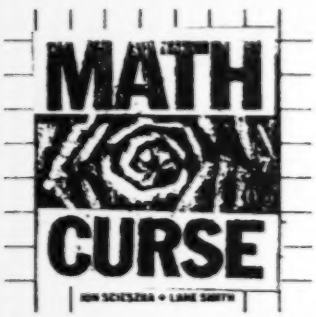
3. *Sir Cumference and the Dragon of Pi* by Cindy Neuschwander (Charlesbridge, 1999).

   Here is another clever tale for geometry students. In the story, Sir Cumference's son Radius must measure the circumference and diameter of many circles to determine the value of pi and

BEST COPY AVAILABLE

rescue his father from a curse.
(www.enc.org/records/014832/)

4. *Math Curse* by Jon Scieszka (Penguin/Putnam, 1995).



This story begins with the challenge from a teacher, Mrs. Fibonacci, that a person can think of almost anything as a math problem. Using math that ranges from arithmetic to the quadratic formula, the humorous book leads readers to discover math problems everywhere in the course of one school day.
(www.enc.org/records/009867/)

5. *How Much Is a Million?* by David M. Schwartz (Lothrop, Lee & Shepard, 1985).

This book takes the reader into the world of large numbers. It offers comparisons that can help conceptualize the meaning of a million, a billion, and a trillion. Here is one example of how magnitude is examined: If a billion kids could stand on each others' shoulders, the tower would reach past the moon.
(www.enc.org/records/001299/)

6. *The Dot and the Line: A Romance in Lower Mathematics* by Norton Juster (SeaStar Book, 2001).

This book tells a tale about relationships on two levels—it is the anguished story of incompatible love and an exploration of the possibilities for geometric shapes!
(www.enc.org/records/021266/)

7. *Is a Blue Whale the Biggest Thing There Is?* by Robert E. Wells (Albert Whitman, 1993).

This book is sure to generate a gasp of amazement and moments of thought in mathematics students. Illustrations help the reader perceive the size of the blue whale, the sun, and maybe even the universe. Thinking about the size of a jar of blue whales, a stack of Mount Everests, or a crateful of sun-sized oranges can help students realize the importance of scientific notation for large numbers.
(www.enc.org/records/014682/)

8. *The Token Gift* by Hugh William McKibbon (Annick, 1996).

The story, set in India, tells of the development of the game of chess. The story can be used to explore the meaning of growth by doubling.
(www.enc.org/records/017323/)

9. *If the World Were a Village* by David J. Smith (Kids Can, 2002).

This is a perfect book for linking mathematics and social studies. It describes the world population in terms of a more easily understandable concept, a global village of 100 people. Using the January 2002 world population of 6,200,000,000 people, the author calculated the nationalities, languages, education levels, and ages for the 100 residents of the global village, in which each person represents 62,000,000 people. The number of people living in the global village who have clean water, electricity, and sufficient food was also calculated. The results will shock students.
(www.enc.org/records/026534/)

10. *G is for Googol: A Math Alphabet Book* by David M. Schwartz (Tricycle, 1998).

This book illustrates and explains mathematical vocabulary from abacus, binary, and cubit to zillion. Information gives insight into the place of mathematics in our world today.
(www.enc.org/records/016027/)

Bonus Books

These excellent books are not in the ENC Collection, but they are available in libraries.

11. *The Missing Piece* by Shel Silverstein (HarperCollins, 1976).

This book presents the dilemma of an incomplete circle. For the mathematically inclined reader, the question can be how big is the missing piece in addition to questions of friendship and loneliness addressed by the author. (See the Bay-Williams article online for activities related to this book.)

12. *Socrates and the Three Little Pigs* by Tuyosi Mori (Putnam, 1986).

If you are teaching probability, combinations and permutations, and tree diagrams, this illustrated book is perfect for your students. It clearly, and cleverly, illustrates the possible arrangements of pigs in houses and shows the related tree diagrams. Artwork is by the renowned illustrator Mitsumasa Anno. (This book is now out of print but it is so excellent for math class that it is worth a search of your district and public libraries.)

BEST COPY AVAILABLE

What are the U.S. Department of Education's top priorities in mathematics and science?

Visit the online *ENC Focus* issue covering the Mathematics and Science Initiative of the U.S. Department of Education to learn about its three broad goals for improving mathematics and science:

- Informing the public, including parents, about the pressing need for better math and science education in the nation's schools.
- Starting a campaign aimed at recruiting, preparing, training, and retaining teachers with strong backgrounds in mathematics and science.
- Developing a research base to help educators understand what improves student learning in mathematics and science.

Online, you'll find more about how the department intends to accomplish these goals. We have included a comprehensive list of specific programs from agencies and organizations across the country working to support the department in this effort.

See **www.enc.org/focus/edinitiative/** for the full content of this issue.

Did you know that:

there are octopuses
that live in trees
and fields of Velcro
growing in California?

It's true, according to the web. In some cases, we instantly know not to believe what we read online, but most of the time, inaccurate information, author bias, or commercial purposes of web sites are hidden beneath the surface.

In this online issue of *ENC Focus*, we explore the unique challenges the web poses as teachers search for information. The full contents of the issue include:

- **An overview on the importance of critically examining web sites**

  The web is a crazy and wonderful new medium, which is just one reason you need to be careful, especially when your students are involved.

- **Teacher-specific criteria for evaluating web sites**

  In addition to key criteria to use as you examine web sites, some web-savvy teachers share what they care about.

- **Quick routes to sources of filtered web sites**

  ENC does a lot of work finding high-quality web sites that teachers should know about, and we aren't the only ones!

- **A chance to weigh in on what matters to you**

  Vote in our poll asking what you look for in web sites.

Find all of this online at **www.enc.org/focus/webeval/**.

Collaborating with Colleagues to Improve Student Learning

This expert on the preparation of new teachers recommends a comprehensive induction plan that enables teachers to become lifelong learners and leaders in their profession.

by Harry K. Wong, Saratoga, California

Collaborating with colleagues to improve student learning focuses on three major questions:

1. How do we improve student learning?
2. How do we improve teacher learning?
3. How and why is collaborating with colleagues the best way for teachers to learn?

Harry K. Wong, a former high school science teacher, is the author of the book *The First Days of School*, which has been adopted by many universities and school districts as a resource for preservice and new teachers. Related articles on new teacher induction are available online (www.newteacher.com).

This article is based on Harry Wong's latest book *New Teacher Induction: How to Train, Support, and Retain New Teachers*, co-authored with Annette Breaux. Both books can be ordered online (www.EffectiveTeaching.com).

How Do We Improve Student Learning?

Let's get away from discussing the fads, philosophies, and politics that pervade education and get right down to the nitty-gritty. Let's pay respect to the dignity and importance of the teaching profession:

- More than 200 studies have shown that the only way to improve student achievement is with a knowledgeable and skillful teacher (National Commission on Teaching & America's Future, 1996).
- Differences in teacher quality account for more than 90 percent of the variation in student achievement (Wyatt, 1998).
- Students who have several effective teachers in a row make dramatic achievement gains, while those who have even two ineffective teachers in a row lose significant ground (Hanushek, 2001; Sanders, 1996).
- More specifically, the research states that as a teacher's competence improves, lower-achieving students are the first to profit (Sanders, 1996).

Therefore, it is the teacher, what the teacher knows and can do, that is the most significant factor in student achievement. Improve the teacher and you improve student learning—period (Sanders, 1996)!

This article is part of a new online feature *ENC Focus* on Supporting New Teachers, published exclusively on ENC Online (www.enc.org). See the bottom of page 10 for an overview of all the content available to web site visitors!

How Do We Improve Teacher Learning?

Even graduates of excellent teacher education programs acknowledge that much of what they know about teaching was learned on the job. Therefore, districts and schools must systematically provide teachers with sustained professional development. This begins with an organized, multiyear induction process.

The primary purpose of induction is to train new teachers to become effective teachers—the kind who improve student achievement. A related goal of the induction process is acculturating new teachers to the importance of lifelong learning. In addition, well-inducted teachers better understand the responsibilities, missions, and philosophies of their districts and schools.

A successful induction program consists of several elements, beginning with an initial four or five days of training in classroom management and effective teaching techniques before school begins. It continues with systematic professional development over a period of two or three years.

Throughout those years, the school administration must show strong support by providing a structure for modeling effective teaching. Inductees need to have the opportunity to visit demonstration classrooms. A supportive mentor is another important component of the induction process. Perhaps most important, the school must provide study groups in which new teachers can network and build support, commitment, and leadership within a learning community.

Successful Induction in New York

The Islip, New York, Public Schools implemented a three-year induction program for new teachers in 1999. They saw a concomitant improvement in student achievement, which they view as resulting from improved teacher performance. (See box below.)

The Islip Public Schools' induction program features collaborative study group activities, led by veteran teachers and district curriculum leaders. Study groups focus on skill-building strategies such as conducting parent conferences, managing the classroom, crafting lesson plans, and implementing cooperative discipline. The groups constantly work on team-building and problem-solving techniques. They use model lessons and hold sharing sessions in which teachers learn from each other and build respect for one another (Breaux & Wong, 2003).

Successful Induction in Louisiana

In the Lafourche Parish, Louisiana, Schools, new teachers are trained to meet the challenges of the classroom and to comply with their state standards. In 2002, 100 percent of the new teachers who participated in the district's induction program successfully completed the performance-based Louisiana Teacher Assistance and Assessment Program, required for teacher certification in the state.

The district's newly structured curriculum is solid, detailed, and well organized; new teachers receive specific training in what and how to teach. The Lafourche induction program is so successful that the Louisiana Department of Education has adopted it as the model for the entire state. More information is available on the Internet (www.doe.state.la.us/DOE/OQE/certification/LAFirst_rl.pdf).

Mentoring Is Not Induction

Before we answer the third question, "How and why is collaborating with colleagues the best way for teachers to learn?" let's deal with a misconception. Many educators believe that all a new teacher needs is a mentor. They try to portray mentoring as an effective stand-alone method for supporting and retaining teachers.

In far too many instances, a mentor is simply a veteran teacher who has been haphazardly selected by the principal and assigned to a new teacher. Sharon Feiman-Nemser, in her *ERIC Digest* article (1996), writes that after 20 years of experimenting with mentoring as a process for helping new teachers, few comprehensive studies validate its effectiveness.

Mentoring is not induction.

Induction is a collaborative process, one that organizes the expertise of educators within the shared values of a culture. In contrast, mentoring is a one-on-one process, concerned with supporting individual teachers. Induction is an organized, sustained, multiyear program. Mentoring may be used as a part of that program.

Mentors are important, but they must be carefully selected and highly trained, have a clear understanding of their purpose, and serve as contributing members of a comprehensive induction program. Any educator seeking to improve the retention of new teachers must understand that mentoring is only one component of a successful induction program.

Results of Islip Public Schools Induction Program

1991-1992	2001-2002
Before Induction Program	After Induction Program
• 40 percent Regents diploma rate	• 70 percent Regents diploma rate
• 80 students enrolled in Advanced Placement classes with 50 percent achieving 3 or higher	• 120 students enrolled in Advanced Placement classes with 73 percent achieving 3 or higher

How and Why Is Collaborating with Colleagues the Best Way for Teachers to Learn?

How do teachers best increase their knowledge and skills? According to a study of the American Institute for Research (AIR), reported by the American Educational Research Association, teachers learn more in collaborative teacher networks and study groups than with mentors or in traditional classes and workshops (Garet, et al., 2001). The study showed that teacher learning is most effective when staff development includes six factors. (See box on page 11.)

The project also found that much professional development currently lacks the six factors. Michael S. Garet, chief researcher at AIR, says, "Professional development largely has been a voluntary activity where teachers can pick and choose from a collection of offerings, but it needs to become a more significant part of schools' and districts' plans of what teachers do. If we are serious about using professional development as a mechanism to improve teaching, we need to invest in activities that have the characteristics that research shows foster improvement in teaching" (Breaux & Wong, 2003).

Districts with sustained induction programs can serve as models. Several, including Islip, New York, and Lafourche Parish, Louisiana, are chronicled in the book, *New Teacher Induction: How to Train, Support, and Retain New Teachers* (Breaux & Wong, 2003). Because of the success of these districts in producing effective teachers, we know the following:

- The era of isolated teaching is over. Students thrive when teachers and school leaders work together in strong professional learning communities.
- Teachers thrive when they feel connected to their schools and colleagues. They want more than a job. They want to contribute to a group, to make a difference.
- The trademark of effective schools is a high-performance culture, in which all teachers take responsibility for the learning of all students.
- Teachers remain with a district when they feel supported by administrators and have strong bonds of connection to a professional learning community that has, at its heart, high-quality interpersonal relationships founded on trust and respect.
- Administrators, staff developers, and teacher leaders must have the knowledge and skills to direct a results-driven, collaborative culture that is part of every teacher's workday.

A structured, sustained, multiyear induction program is a critical element in reducing the exceedingly high rate of teacher attrition we are facing today. We must work together to create a professional culture in which teachers thrive and grow throughout their careers. The result will be quality teaching and improved student learning in every classroom.

References

Breaux, Annette L. & Wong, Harry K. (2003). *New Teacher Induction: How to Train, Support, and Retain New Teachers*. Mountain View, CA : Harry K. Wong Publications.

Feiman-Nemser, Sharon. (1996). Teacher Mentoring: A Critical Review. *ERIC Digest*. ED397060. Retrieved: www.ericfacility.net/ericdigests/ed397060.html

Garet, Michael, Andrew Porter, Laura Desmoine, Beatrice Birman, & Kwang Suk Yoon. (Winter 2001). What Makes Professional Development Effective? *American Educational Research Journal*, pp. 915-946.

New on ENC Online!

Focus on Supporting New Teachers

Trying to meet the mandates of the *No Child Left Behind Act* (NCLB)?

Education and retention of quality teachers are key elements of NCLB, and the support of new teachers is an important component of those efforts.

Harry Wong's article "Collaborating with Colleagues to Improve Student Learning" (page 8) is the core of a brand-new online feature *ENC Focus* on Supporting New Teachers (www.enc.org/focus/newteachers/). In addition to Wong's article, we've gathered together articles, resources selected from the ENC collection, and links to web sites. Here's a quick overview of what you'll find online:

Articles

"The School as a Professional Learning Community: A Scenario" by Rick DuFour and Robert Eaker.

This excerpt from the book *Professional Learning Communities at Work. Best Practices for Enhancing Student Achievement* describes how a new teacher was oriented in a school with an effective learning community.

Six Factors for Successful Staff Development

The American Institute for Research identified six factors that make professional development effective and improve instruction in math and science.

Form: Teachers learned more in teacher networks and study groups than with mentors or in traditional classes and workshops.

Duration: Sustained, intensive programs are better than shorter ones.

Collective Participation: Activities designed for teachers in the same school, grade, or subject are better than programs that target groups of teachers who do not work together.

Content: Programs that focus on how to teach and also what to teach—content knowledge—are key.

Active Learning: Teachers need to observe and be observed, to plan for classroom implementation, to review student work, and to be involved in cohort groups where they are actively writing, presenting, and leading.

Coherence: Teachers need to perceive professional development as a coherent part of other activities at their schools, such as meeting state standards or adoption of new textbooks.

These findings were reported in the winter 2001 issue of the *American Educational Research Journal*. The study was based on responses from a nationally representative sample of 1,027 public school math and science teachers in kindergarten through grade 12. The project was conducted at the American Institute for Research with funds from the U.S. Department of Education's Planning and Evaluation Service. It was carried out as part of the National Evaluation of the Eisenhower Professional Development Program.

Hanushek, E.A., Kain, J.F., & Rivkin, S.G. (2001). *Why Public Schools Lose Teachers*. (NBER Working Paper 8599). Cambridge, MA: National Bureau of Economic Research.

National Commission on Teaching & America's Future. (1996). *What Matters Most: Teaching for America's Future*. Woodbridge, CA: Author. Retrieved: www.nctaf.org/publications/whatmattersmost.html.

Sanders, W. (1996). Cumulative and Residual Effects of Teachers on Future Student Academic Achievement. Knoxville: University of Tennesee Value-Added Research & Assessment Center.

Wyatt, Joe. (August 6, 1998). Test Colleges on How They Prep Teachers. *USA Today*, 13A.

"Working with the Teacher Across the Hall—and Across the Country" by Mary Bagalonis.

A calculus teacher in Westhill, New York, describes her work coaching a student teacher and a new teacher in her building as well as her online work with a teacher in California who had never taught calculus before.

"Home-Grown Professional Learning" by Ronald Havlice.

Originally published in *ENC Focus* in 2001, this article describes the professional development program created by the science teachers in one district. It includes a realistic look at the difficulties faced by new teachers and presents one solution to a specific problem.

"Mentoring" by Pam Robbins.

This online article was first published in 1999 in the *Journal of Staff Development*, a publication of the National Staff Development Council (NSDC). The author provides a detailed process to help districts develop a mentoring program.

"Teachers Get Help from 'Guide on the Side'" by John Norton.

This reprint from NSDC's publication *Results* (2000) describes a program that provides coaching for veteran teachers facing new roles and responsibilities as well as for new teachers.

Selected from the ENC Collection

Resources for Those Supporting New Teachers

New Teacher Induction: How to Train, Support, and Retain New Teachers
(See article on page 8.)
www.enc.org/records/027326/

Mentoring Programs for New Teachers: Models of Induction and Support
www.enc.org/records/024780/

Training Mentors Is not Enough, Everything Else Schools and Districts Need to Do
www.enc.org/records/019646/

Science Teacher Retention: Mentoring and Renewal
www.enc.org/records/026397/

Resources for New Teachers

The First Days of School
www.enc.org/records/018240/

A Classroom of Her Own: How New Teachers Develop Instructional, Professional, and Cultural Competence
www.enc.org/records/026469/

The Collaboration Guide for Early Career Educators (See box below.)
www.enc.org/records/026849/

Survival Guide for New Teachers
www.ed.gov/pubs/survivalguide/index.html
For an abstract see www.enc.org/records/026595/.

What to Expect in Your First Year of Teaching
www.ed.gov/pubs/FirstYear/
For an abstract see www.enc.org/records/013868/.

Additional Web Resources for those Supporting New Teachers

A Guide to Developing Teacher Induction Programs
www.rnt.org/resources/a+guide+to+developing+teacher+i.pdf

Research Matters
www.teachingquality.org/ResearchMatters/issues/2003/issue05-May2003.pdf

Solving the Dilemmas of Teacher Supply, Demand and Standards
www.nctaf.org/publications/solving.pdf

Visit www.enc.org/focus/newteachers/

On the web page above you'll find complete articles and information about resources to help you recruit and retain the quality teachers required in the *No Child Left Behind Act* (NCLB). Here's just a sample of the kind of information you'll find about all the items listed on this page:

The Collaboration Guide for Early Career Educators (2000)

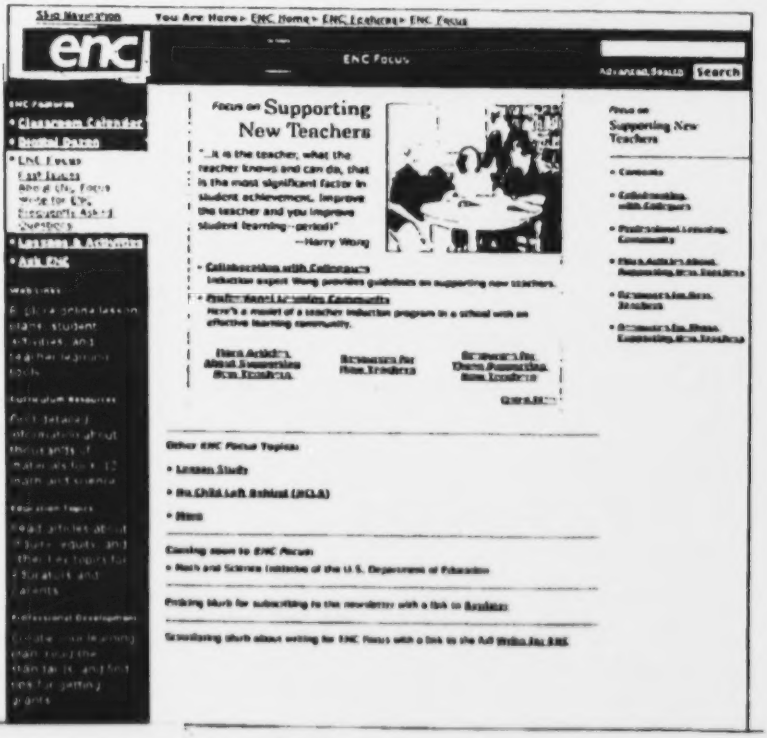
By Mary Susan E. Fishbaugh

This book helps early career teachers make informed decisions about choosing and participating in professional collaborative environments. Chapters describe the three main types of collaboration: consulting, coaching, and teaming, along with the purposes unique to each type. The author also discusses how to choose a mentor, how to partner with community resources, and how to resolve conflicts with colleagues. Teacher vignettes, tables, and review boxes support the reading.

Ordering Information:

Paul H. Brookes Publishing Co.
(800) 638-3775
www.brookespublishing.com

(See complete catalog record online at www.enc.org/records/026849/)



BEST COPY AVAILABLE

Connecting Research with Resources

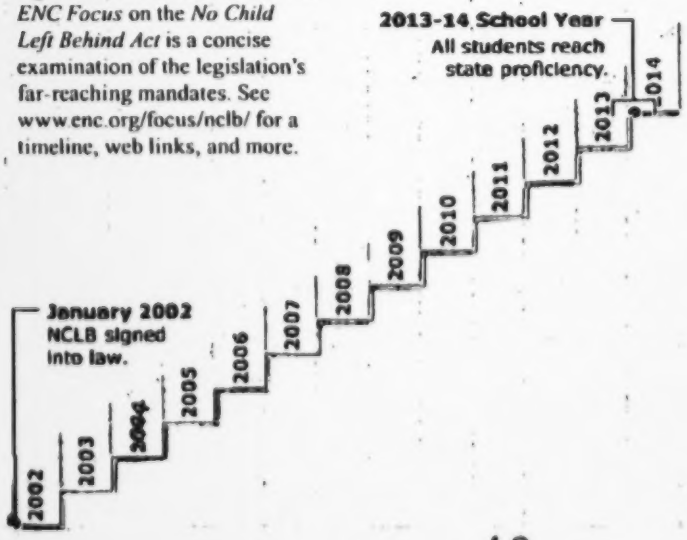
Did you know that ENC tracks down research studies related to the resources in our collection of teaching and professional development materials? Many of the catalog records describing those resources contain extensive information with links to relevant and specific research.

For example, see the complete record for the eighth grade textbook *Looking for Pythagoras: The Pythagorean Theorem* from the Connected Mathematics series (www.enc.org/records/010537/). Research links from this record include a study conducted by the Show-Me Center funded by the National Science Foundation (*Research on Use of Standards-Based Middle Grades Curriculum Materials)*, information from a few state agencies on how the work aligns with state standards, and research reports from the University of Washington and Michigan State University.

Finding these sources of scientifically based information is just one way that ENC supports your efforts to bridge research and practice at the school level.

All Children Proficient by 2014

"No Child Left Behind" may be the best-known name ever for an education bill, but the complex legislation is not so well known. *ENC Focus* on the *No Child Left Behind Act* is a concise examination of the legislation's far-reaching mandates. See www.enc.org/focus/nclb/ for a timeline, web links, and more.



No Teacher Is an Island

Teachers use lesson study as a professional learning strategy to improve specific classroom practices. See the online issue of *ENC Focus* on Lesson Study (www.enc.org/focus/lessonstudy/) for several articles and resources that explore this exciting learning model. Articles include:

"Improving Student Learning One-Lesson-at-a-Time" by Jenny Sue Flannagan, Virginia Beach City Public Schools, Virginia Beach, Virginia, and M. Gail Derrick, Regent University, Virginia Beach, Virginia

These professional developers describe the lesson study model of professional development and provide a list of references to research articles on the technique.

"Teachers' Perspective on Lesson Study" by Danielle Kreassig, Scott Michels, Rachel McMillan, and Verna Overstreet, Corporate Landing Middle School, Virginia Beach, Virginia

This group of middle school science teachers viewed their practice in a whole new way after participating in the lesson study model of professional development described by Flannagan and Derrick.

"Changing the Culture of Teaching" by Anne E. Gregory and Jonathan L. Brendefur, Boise State University, Boise, Idaho

These professional developers are using the lesson study technique with hundreds of teachers in Idaho. Once involved, teachers are no longer isolated but become true professionals capable of instituting authentic reform.

BEST COPY AVAILABLE

United States Department of Education
Eisenhower National Clearinghouse
1929 Kenny Road
Columbus, OH 43210-1079

Official Business Only

Penalty for Private Use, $300

PRSRT STD
Postage and Fees Paid
U.S. Department of Education
Permit No. G-17

**********ECRLOT**C001
P-1 P68

LIBRARIAN ENC
1929 KENNY ROAD
COLUMBUS OH 43210-1015

Please update your name or address by sending email to editor@enc.org or by calling toll free (800) 621-5785.

Please share this publication with all math and science educators!

Visit ENC Online: www.enc.org

ENC 03-003

17

BEST COPY AVAILABLE

U.S. Department of Education
Office of Educational Research and Improvement (OERI)
National Library of Education (NLE)
Educational Resources Information Center (ERIC)

NOTICE

Reproduction Basis

	This document is covered by a signed "Reproduction Release (Blanket)" form (on file within the ERIC system), encompassing all or classes of documents from its source organization and, therefore, does not require a "Specific Document" Release form.
X	This document is Federally-funded, or carries its own permission to reproduce, or is otherwise in the public domain and, therefore, may be reproduced by ERIC without a signed Reproduction Release form (either "Specific Document" or "Blanket").